

Appendix E

Proposed Restoration Projects

Proposed Restoration Project: Fishery Habitat Enhancement (see Map 2-1 and Table E-1)

Project Objectives

To improve habitat complexity and passage on BLM-administered land for salmon and trout, to mitigate any adverse effects from erosion, and to improve shade and future large wood recruitment in the first 160' from the stream.

Desired Future Conditions

Improved passage through culverts; logs almost parallel to the stream; rock weirs and logs to provide spawning gravel retention and rearing habitat; and trees reestablished in the Riparian Reserve to improve shade and future large wood recruitment to the stream.

Project Design Features

Replacement of four culverts for trout and potential coho passage would open five miles of habitat. The use of rock weirs would aid in collecting gravels for spawning and create plunge pools for rearing. Rock weirs would vary from 3 weirs per mile to 10 weirs per mile. Up to 40 cubic yards of gravel would be placed above rock weirs where possible.

Where accessible, large wood (20-24" DBH) would be placed almost parallel to the streambank for adult holding cover. Log placement would vary from 15 logs per mile to 25 logs per mile. Smaller diameter trees would be taken from riparian reserve thinnings and added to the stream where appropriate. As part of the riparian thinning restoration plan, trees 10 to 80 years old would be felled within 160' of the stream for instream habitat, provided 50 percent canopy is retained. Fifteen logs per mile is based on the Klamath Province and twenty-five logs per mile is based on a mix of Klamath and Cascade Province recommendations (Shatford 2002, 23-24).

Smaller diameter trees would be taken from Riparian Reserve thinnings and added to the stream where appropriate. As part of the riparian thinning restoration plan, trees 10 to 80 years old would be thinned from 30-160 feet from stream channel, provided at least 40 percent canopy cover is retained.

Instream projects would include the use of an excavator. Any temporary skid trails needed to access the stream would be water-barred and seeded. The excavator would make a 12-foot wide path from the road to the stream, with no more than ten passes on the path. No blading on the path would occur. Other resources in conflict with the designated sites would be mitigated with a buffer. Equipment would avoid archeological and botanical sites. West Branch Elk Creek includes existing logs from the fire with little supplementation needed of off-site logs. Equipment would avoid archeological and botanical sites.

Table E-1. Fishery Habitat Projects

Alternative	Project	Location	Miles Treated	Cost
B-G	Culvert Replacement	West Branch Elk Creek	4	\$400,000
	Rock Weirs			
E	10 per mile	Sugarpine Creek	1.7	\$42,500
E		Hawk Creek	1.1	\$27,500
E		Timber Creek	1.0	\$25,000
E		Flat Creek	0.8	\$20,000
C, D, G	5 per mile	Sugarpine Creek	1.7	\$21,500
C, D, G		Hawk Creek	1.1	\$13,750
C, D, G		Timber Creek	1.0	\$12,500
C, D, G		Flat Creek	0.8	\$10,000
B, F	3 per mile	Sugarpine Creek	1.7	\$12,750
B, F		Hawk Creek	1.1	\$8,250
B, F		Timber Creek	1.0	\$7,500
B, F		Flat Creek	0.8	\$6,000
	Instream Logs			
E, F	25 per mile	Sugarpine Creek	1.7	\$42,500
E, F		Hawk Creek	1.1	\$27,500
E, F		Timber Creek	1.0	\$25,000
E, F		Flat Creek	0.8	\$20,000
E, F		West Branch Elk Creek	0.5	\$12,500
C, D, G	20 per mile	Sugarpine Creek	1.7	\$34,000
C, D, G		Hawk Creek	1.1	\$22,000
C, D, G		Timber Creek	1.0	\$20,000
C, D, G		Flat Creek	0.8	\$16,000
C, D, G		West Branch Elk Creek	0.5	\$10,000
B	15 per mile	Sugarpine Creek	1.7	\$25,500
B		Hawk Creek	1.1	\$16,500
B		Timber Creek	1.0	\$15,000
B		Flat Creek	0.8	\$12,000
B		West Branch Elk Creek	0.5	\$7,500
	Gravel			
E, G	10 weirs per mile	39 yd ³ per weir	4.6	\$90,000
C, D	5 weirs per mile	39 yd ³ per weir	4.6	\$45,000
B	3 weirs per mile	39 yd ³ per weir	4.6	\$27,000
NOTE: No projects are proposed in Alternative A.				

Proposed Restoration Project: Late-Successional Forest Habitat Restoration (see Map 2-2 and Table E-2)

Project Objectives

Accelerate the growth of trees in stands to promote late-successional conditions with a variety of size classes. Maintain species diversity to promote connectivity between owl activity sites and develop late-successional forest characteristics.

Desired Future Conditions

Suitable spotted owl habitat for nesting, roosting, and foraging composed of mature timber stands. Stands contain large conifers (21" DBH or greater), multi-layered structure, and 60 percent or greater canopy closure (USDA and USDI 2001, I-2, 3). Understory should be open between shrub layer and mid-canopy for flight paths. Nest sites include cavities 50 or more feet above the ground in large decadent old growth conifers, large mistletoe clumps, old raptor nests, and platforms formed by whorls of large branches.

Project Design Features

Stands of trees less than 8" DBH (10-29 years old) would be pre-commercially thinned (PCT) to accelerate the growth of reserve trees. Stands of trees greater than 8" DBH (30-80 years old) would be commercially thinned to increase growth on residual trees, retain and promote large branches on select trees, promote the development of variable tree sizes in the residual stand, and retain the variety of species present.

Condition 1: Young conifer plantations generally 10 to 30 years old.

These stands are comprised of conifers of similar size. Thin conifers to a spacing range of 12-15' to increase growth rates, yet allow for crown closure within 10-20 years. This would promote natural shading, mortality, and removal of lower limbs. Retain unthinned patches up to one-half acre in size for every 10 acres thinned. Retain up to 25 percent canopy component in hardwoods. Select up to 25 trees per acre and remove all surrounding vegetation for approximately 5' beyond the dripline. This would increase growth rates and retain limbs to allow for future large branches as these trees mature and become dominant in the overstory. Pile and burn slash from operations.

Condition 2: Young stands with mixed age and size classes, scattered overstory conifers.

These stands also have variable densities of conifers and hardwoods. In areas where predominant conifer size is less than 3" DBH, thin to a spacing of 12-15'. Areas where the predominant conifer size is 3-8" DBH, thin to a spacing of 15-20'. Retain unthinned patches up to one-half acre in size for every 10 acres thinned. Retain hardwood trees unless they constitute greater than 25 percent of the canopy. Reduce hardwood component to 25 percent of canopy in stand being treated. Pile and burn slash from operations.

Condition 3: Stands dominated by conifers in age classes from 30 to 80 years old.

Conifer and hardwood densities and size classes are variable. Stands would be thinned to a basal area range of 120-140 feet per acre of total overstory basal area, retaining a minimum of 50 percent canopy closure in stand. Retain unthinned patches up to one-half acre in size for every 10 acres thinned. Retain up to 25 percent of canopy component in hardwoods. Reserve trees would be a mix of species present. Variable spacing and reserving both dominant and codominant tree sizes is preferred over even-spacing and even-size distribution of reserve trees. Pile and burn slash from operations.

Table E-2. Late-Successional Forest Habitat Restoration Projects

Alternative	Acres		Condition Class Treatment (see Project Design Features above)	Costs	
	Pre-Commercial	Commercial		Pile and Burn	Thin
B	1,102	0	Conditions 1 and 2. PCT stands <8" DBH and >40% canopy closure.	\$661,200	\$198,360
				Total	
				\$859,560	
C, G	862	466	Conditions 1, 2, 3. PCT and commercially thin stands 10-80 years old and >70% canopy closure. Commercial harvest only trees in excess of LSRA CWD retention level (5% ground cover or ~28 tpa, 70+ years old).	\$796,800	\$229,720
				Total	
				\$1,026,520	
D	862	466	Conditions 1, 2, 3. PCT and commercially thin stands 10-80 years old and >70% canopy closure. Commercial harvest only trees in excess of DecAID CWD retention level (2% ground cover in 10-19" stands or ~17 tpa, 15" DBH by 60' high).	\$796,800	\$229,720
				Total	
				\$1,026,520	
E	1,102	876	Conditions 1, 2, 3. PCT and commercially thin stands 10-80 years old and >40% canopy closure. Commercial harvest only trees in excess of DecAID CWD retention level (2% ground cover in 10-19" stands or ~17 tpa, 15" DBH by 60' high).	\$1,186,800	\$338,520
				Total	
				\$1,525,320	
A, F	No Projects Proposed.				
NOTE: PCT costs range from \$160 to \$200 per acre. \$180 per acre used for PCT cost estimate. Commercial thin cost estimate used is \$160 per acre. Piling and burning costs range from \$400 to \$800 per acre. \$600 per acre used for cost estimate.					

Proposed Restoration Project: Pine Habitat Restoration (see Map 2-2 and Table E-3)

Project Objectives

Promote pine species regeneration in areas historically inhabited by pines, retaining existing dominant pine in the overstory.
Promote pine dominance in stands historically dominated by pines but presently dominated by Douglas-fir and other species.

Desired Future Conditions

Ponderosa and sugar pines dominant in the overstory up to 23 trees per acre (tpa) with a codominant component of pines (<20" DBH) up to 40 tpa. An understory of conifers dominated by pines (<12" DBH) with less than 80 tpa (USDA and USDI 1998, 179). Mix of conifers in the overstory, including Douglas-fir and incense cedar and a component of hardwoods in mid-canopy and understory including madrone and chinquapin.

Project Design Features

Stands with ponderosa or sugar pine present in overstory or understory, or historic presence of pine in overstory would be thinned to promote pine retention and growth. Large overstory pines would have non-pine vegetation in understory removed to promote pine regeneration. Stands with pine less than 80 years old would be thinned to retain pine and promote growth of existing pine in stand.

- **Stands with large (>20" DBH and >80 years old) overstory ponderosa or sugar pines present.**

In areas where pine are not present in the understory, clear around large (>24" DBH) overstory pines for up to 20' beyond dripline to promote pine regeneration. Trees up to 24" may be removed (USDA and USDI 1998, 165). When large overstory trees are within 50' of each other, only one of those trees would receive understory clearing.

Beyond the clearing area, pre-commercial thin (14-20 foot spacing) understory stands (<8" DBH) presently consisting of Douglas-fir, white fir, incense cedar, ponderosa and sugar pine, madrone, and chinquapin to favor dominance of pine species as residual stand.

Beyond the clearing area, commercial thin understory stands (>8" DBH) retaining 100-180 square feet of total basal area retaining the same species preference for pine. Only trees less than 80 years old would be removed. These would generally be less than 18" DBH.

- **Stands with sugar and ponderosa pines present in overstory predominantly less than 18" DBH (30-80 years old).**

Commercial thin these stands favoring all healthy pines for reserve trees retaining 100-180 square feet of total basal area (USDA and USDI 1998, 190).

- **Young stands less than 8" DBH with pine present and without pine in the overstory, but with historic presence of pine in the overstory.**

Pre-commercial thin (14-20 foot spacing) stands presently consisting of Douglas-fir, white fir, incense cedar, ponderosa and sugar pine, madrone, and chinquapin to favor dominance of pine species as residual stand. Retain unthinned patches up to ½ acre in size for every 10 acres thinned

Introduce prescribed fire into the understory after reducing initial fuel loadings through piling and burning of piles.

Table E-3. Proposed Pine Habitat Restoration			
Alternative	Acres	Description	Cost
B	156	PCT stands with pine <10-30 years old; <8" DBH; >10% canopy. 14-20' spacing.	\$121,680
C, D, G	793	PCT pine stands 10-30 years old; <8" DBH; >10% canopy. 14-20' spacing (16 acres). Commercial thin stands 30-80 years old; >8" DBH; >40% canopy closure (91 acres). Clear around pines >24" DBH and commercial thin stands >80 years old (686 acres).	\$447,600
E	2,005	PCT pine stands 10-30 years old; <8" DBH; >10% canopy. 14-20' spacing (156 acres). Commercial thin stands 30-80 years old; >8" DBH; >10% canopy closure (162 acres). Clear around pines >24" DBH and commercial thin stands >80 years old (1,687 acres).	\$1,471,280
A, F	None.		\$0
NOTE: Costs used are \$160 per acre for commercial thinning and clearing around pine, and \$400 per acre for piling and burning. Costs used are \$180 per acre for PCT treatment and clearing around pine, and \$600 per acre for piling and burning.			

Proposed Restoration Project: Riparian Reserve Thinning (see Map 2-2 and Table E-4)

Project Objectives

Improve the habitat and functioning of Riparian Reserves for late-successional dependent terrestrial and aquatic organisms. Accelerate the growth rates and size variability of residual trees in the existing stands and maintain species diversity.

Desired Future Conditions

Functioning riparian area that allows for late-successional species movement and stream protection, and maintains species composition and characteristics needed to attain Aquatic Conservation Strategy. Attain 75 percent late seral vegetation in riparian areas. Riparian vegetation would be dominated by large (>24" DBH) conifers with a diverse species composition including riparian hardwoods and mixed conifer species. Conifer species of preference would be Douglas-fir, incense cedar, and pacific yew, with western hemlock and white fir in the upper elevations (above 3,500') and ponderosa and sugar pines in the lower elevations (below 3,000'), particularly on south exposures. Hardwood species to favor include alder, big leaf maple, and Oregon ash. Canopy closures would generally be greater than 70 percent. The stand would be able to supply amounts and distributions of coarse woody debris sufficient to sustain physical stability and complexity (USDI 1995, 22).

Project Design Features

Stands of trees less than 8" DBH (10-30 years old) within Riparian Reserves would be pre-commercially thinned to accelerate the growth of residual trees. Retain unthinned patches up to one-half acre in size for every ten acres thinned. Stands of trees greater than 8" DBH (30-80 years old) would have up to 12 dominant tpa selected and competing trees with crowns touching would be felled or girdled. This would be done to increase growth of residual trees, promote large branches on select trees, and develop the recruitment of large woody material for streams. Felling and girdling would occur on trees less than 20" DBH. Thinning would be performed on an irregular spacing with reserve trees selected to aid in the development of future stand characteristics such as variable spacing, multistory canopies, large limbs, and canopy gaps (USFS 2000). Pile and burn slash from treatments in stands <8" DBH. Leave a no-cut buffer zone 50' from streams containing coho salmon and 30' from all other streams.

Table E-4. Riparian Reserve Thinning

Alternative	Acres		Treatment	Costs	
	<8" DBH	> 8" DBH		Pile and Burn	Thin
B	117	0	Perennial streams only. PCT stands <8" DBH and >40% canopy closure. Conifers spaced 14-20'; 110 to 220 tpa. In areas <110 tpa, clear shrubs touching conifers. Pile and burn slash. In stands with variable age and size classes, conifers >8" DBH are preferred for leave, provided they are not suppressed remnants from a harvested stand with <20% crown ratios. Retain species mix and favor minor species for leave. Release up to 25 conifers per acre; clear all vegetation within 5' radius of dripline of leave trees. Retain hardwoods, except within dripline of leave trees.	\$70,200	\$21,060
				Total	
				\$91,260	

Table E-4. Riparian Reserve Thinning					
Alternative	Acres		Treatment	Costs	
	<8" DBH	> 8" DBH		Pile and Burn	Thin
C, G	225	134	<p>Perennial streams only.</p> <p>PCT stands <8" DBH and >40% and <40% canopy closure. Conifers spaced 14'-20'; 110 to 220 tpa. In areas <110 tpa, clear shrubs touching conifers. Pile and burn slash.</p> <p>In stands with variable age and size classes, conifers >8" DBH are preferred for leave, provided they are not suppressed remnants from a harvested stand with <20% crown ratios.</p> <p>Retain species mix and favor minor species for leave.</p> <p>Release up to 25 conifers per acre; clear all vegetation with 5' radius of dripline of leave trees.</p> <p>Retain hardwoods, except within dripline of leave trees.</p> <p>Thin in stands between 8" and 20" DBH and >40% and <40% canopy closure. Select 12 dominant tpa spaced ≈60'. Fall or girdle only the trees with crowns touching the selected leave trees.</p> <p>Maintain 5% ground cover (28 tpa, 70+ years old) in CWD.</p> <p>Felled trees remain on site or placed in stream for CWD. If felled trees >20 tons per acre (25, 16" DBH trees), girdle non-reserved trees.</p>	\$215,400	\$67,300
				Total	
				\$282,700	
D	225	134	<p>Perennial streams only.</p> <p>PCT stands <8" DBH and >40% and <40% canopy closure. Conifers spaced 14'-20'; 110 to 220 tpa. In areas <110 tpa, clear shrubs touching conifers. Pile and burn slash.</p> <p>In stands with variable age and size classes, conifers >8" DBH are preferred for leave, provided they are not suppressed remnants from a harvested stand with <20% crown ratios.</p> <p>Retain species mix and favor minor species for leave.</p> <p>Release up to 25 conifers per acre; clear all vegetation with 5' radius of dripline of leave trees.</p> <p>Retain hardwoods, except within dripline of leave trees.</p> <p>Thin in stands between 8" and 20" DBH and >40% and <40% canopy closure. Select 12 dominant tpa spaced ≈60'. Fall or girdle only the trees with crowns touching the selected leave trees.</p> <p>Felled trees remain on site for CWD. CWD level from DecAID; 4.8% ground cover (≈40 tpa, 15" DBH or ≈24 tpa, 20" DBH). If felled trees >20 tons per acre (25, 16" DBH trees), girdle non-reserved trees.</p>	\$215,400	\$67,300
				Total	
				\$282,700	

Table E-4. Riparian Reserve Thinning

Alternative	Acres		Treatment	Costs	
	<8" DBH	> 8" DBH		Pile and Burn	Thin
E	437	613	All streams. PCT stands <8" DBH and >40% and <40% canopy closure. Conifers spaced 14-20'; 110 to 220 tpa. In areas <110 tpa, clear shrubs touching selected conifers. Pile and burn slash. In stands with variable age and size classes, conifers >8" DBH are preferred for leave, provided they are not suppressed remnants from a harvested stand with <20% crown ratios. Retain species mix and favor minor species for leave. Release up to 25 conifers per acre; clear all vegetation with 5' radius of dripline of leave trees. Retain hardwoods, except within dripline of leave trees. Thin in stands between 8" and 20" DBH and >40% and <40% canopy closure. Leave 160 ft² basal area per acre. Retain minimum 60% canopy closure. 15-25' spacing for leave conifers. Variable spacing, reserving both dominant and codominant trees, is preferred. Felled trees remain on site for CWD. CWD level from DecAID; 4.8% ground cover (≈40 tpa, 15" DBH or ≈24 tpa, 20" DBH). If felled trees >20 tons per acre (25, 16" DBH trees), girdle non-reserved trees.	\$630,000	\$201,260
				Total	
				\$831,260	
A, F	No Projects Proposed.				
NOTE: PCT costs range from \$160 to \$200 per acre. \$180 per acre used for cost estimate. Thinning and girdling costs range from \$150 to \$250 per acre. \$200 per acre used for cost estimate. Piling and burning costs range from \$400 to \$800 per acre. \$600 per acre used for cost estimate.					

Proposed Restoration Project: Oak Woodland and Meadow Restoration (see Map 2-3 and Table E-5)

Project Objectives

Maintain or enhance oak woodland and meadow values for wildlife, range, plants, and biological diversity. Protect and improve special habitats within the Elk Creek Watershed.

Desired Future Conditions

Oak woodlands in an open condition that favors large oaks and pines and a diversity of native grasses, forbs, and shrubs and also provides for future regeneration of oaks and pines. Meadows would be in an open condition with healthy native grasses and forbs.

Project Design Features

Management activities could include manually thinning small-diameter white oak; removing competing conifers; clearing around large, healthy pine; manually cutting, piling, and burning older brush patches; and applying frequent low-intensity prescribed fire. Meadow openings would be maintained by removing Douglas-fir and incense cedar from around the edges of meadows.

Inside the fire perimeter, sites would be monitored and treatment applied when vegetative conditions warrant (in 5-15 years). Those conditions are:

- Numerous small conifer seedlings reappearing on a site.
- Large amounts of brush seedlings reoccupying the site.
- Oak resprouting or oak seedlings reoccupying the site.

Outside the fire perimeter, site-specific treatment would include the following:

- Manually thinning small-diameter white oak.
- Manually thinning small competing conifers.
- Clearing around large, healthy pine.
- Manually cutting, piling and burning older brush patches.
- Applying low-intensity fire.
- Stagger treatments over several years so areas are treated at different times and oak woodlands are in different successional stages across the landscape. Treatments would not begin until at least 2004.

Prescribed fire would be applied under conditions when a low intensity, short-duration fire would occur. Heat flame-length would average 3 feet or less. Fires would need to be prescribed while reestablishing vegetation is small enough to be susceptible to the low flame lengths. Some manual slashing of woody vegetation may be required prior to burning in order to meet resource objectives.

Table E-5. Oak Woodlands and Meadow Restoration

Alternative	Legal Description	Acres	Cost
A	No Projects		
C,D,E,F,G	T32S, R1E, Sec. 29	56	\$11,200
C,D,E,F,G	T33S, R1E, Sec. 3	123	\$24,600
C,D,E,F,G	T33S, R1E, Sec. 7	34	\$6,800
C,D,E,F,G	T33S, R1E, Sec. 9	27	\$5,400
C,D,E,F,G	T33S, R1E, Sec. 10	176	\$35,200
C,D,E,F,G	T33S, R1E, Sec. 15	97	\$19,400
C,D,E,F,G	T33S, R1E, Sec. 17	6	\$1,200
C,D,E,F,G	T33S, R1W, Sec. 1	36	\$7,200
B,C,D,E,G	T32S, R1E, Sec. 27	30	\$6,000
B,C,D,E,G	T32S, R2E, Sec. 29	12	\$2,400
B,C,D,E,G	T32S, R2E, Sec. 31	102	\$20,400
B,C,D,E,G	T32S, R2E, Sec. 32	14	\$2,800
B,C,D,E,G	T33S, R1E, Sec. 17	21	\$4,200
B,C,D,E,G	T33S, R1E, Sec. 19	510	\$102,000
B,C,D,E,G	T33S, R1E, Sec. 21	182	\$36,400
B,C,D,E,G	T33S, R1E, Sec. 30	133	\$26,600

Proposed Restoration Project: Reforestation (see Map 2-4 and Table E-6)

Project Objectives

Reforest areas that supported forest vegetation before the fire. Plant areas with species representative of the plant series existing in those forest stands. Place a stand on a pathway toward a mixed conifer forest that can, more quickly, obtain the attributes of a late-successional forest than would occur naturally.

Desired Future Conditions

Mixed conifer stands at age 20 with a minimum of 70 percent canopy closure and a hardwood component of up to 25 percent of canopy. Retain a residual level of remnant overstory trees, snags, and coarse woody debris as described in stand advisories for late-successional habitat or the LSRA. This is an interim stage. The final condition for stands in this watershed is described in the proposed Late-Successional Forest Habitat Restoration project.

Project Design Features

Areas burned at high or moderate severity levels would be planted with tree seedlings to a species mix consistent with those species present in those locations before the fire. Priority for planting would be in past plantations, areas with slopes greater than 65 percent, riparian areas, and remaining areas of high or moderate burn intensity, including spotted owl activity centers.

Table E-6. Tree Planting within the Fire Perimeter					
Alternatives	Acres	Spacing	Description	Areas to Avoid	Cost
A, E	6,000	Follow ESRP guidelines. 10'x10' spacing; 430 trees per acre (tpa).	Species mix of conifers (Douglas-fir, sugar and ponderosa pines, incense cedar). Plant hardwoods (i.e., alder and maple) and conifers in riparian areas.	No planting in patches <5 acres.	\$600,000
B	3,016	10'x10' spacing with microsite emphasis; 430 tpa. No mulching, tubing, and shading unless replanting. Replant if seedling survival is <100 tpa.	Remove vegetation around 50% of seedlings. Species mix of conifers (Douglas-fir, sugar and ponderosa pines, incense cedar, white fir). Plant hardwoods (i.e., alder and maple) and conifers in riparian areas. Add hemlock in riparian areas above 3,500' elevation	No planting in low burn severity areas; oak woodlands; patches <10 acres.	\$301,600
C, D, G	2,152	10'x10' spacing with microsite emphasis; 430 tpa. No mulching, tubing, and shading unless replanting. Replant if seedling survival is < 100 tpa.	Remove vegetation around 50% of seedlings if density is >250 tpa. Remove vegetation around all seedlings if density is <250 tpa. Species mix of conifers (Douglas-fir, sugar and ponderosa pines, incense cedar, white fir). Plant hardwoods (i.e., alder and maple) and conifers in riparian areas. Add hemlock in riparian areas above 3,500' elevation.	No planting in low burn severity areas; oak woodlands; patches <5 acres.	\$215,200
F	1,045	10'x10'; 430 tpa. Reevaluate after 3 years. Replant if natural processes are not recovering.	Species mix of conifers (Douglas-fir, sugar and ponderosa pines, incense cedar, white fir). Plant hardwoods (i.e., alder and maple) and conifers in riparian areas. Add hemlock in riparian areas above 3,500' elevation.	Plant only in riparian areas and slopes >65%.	\$104,500
NOTE: Average cost for tree planting in fire area is \$100 per acre.					

Proposed Reforestation Research Project (see Tables E-7 and E-8)

Project Objectives

To evaluate mixed-species reforestation plantings, to identify and characterize temporal patterns of vegetation structural development and species diversity, to assess temporal dynamics of fuels loading and fire risk, and to determine impacts of snag retention on survival and growth of planted trees.

For the initial phases of stand development, there are six specific research objectives to determine the effects of:

1. snag retention on the survival and establishment of planted seedlings by species,
2. planted seedling versus natural regeneration on tree survival and growth,
3. monoculture versus mixed-species plantings on planted seedling survival and growth,
4. planting density on survival and growth of planted seedlings by species, and site occupancy by planted and naturally regenerating trees, shrubs, and herbs,
5. weed control on planted seedling establishment and growth of trees, shrubs, and herbs, and
6. physiographic site conditions on planted seedling survival and growth of trees, shrubs, and herbs

Desired Future Conditions

Forest stands having a high degree of species and structural diversity (relative to monospecific plantations) in which Douglas-fir, white fir, and incense cedar contribute to the main overstory canopy as codominants; dispersed sugar pine and ponderosa pine having complex canopy structure and large diameter stems and branches as dominants; and sub-canopy hardwood trees providing structural continuity between understory shrubs and the overstory.

Project Design Features

This planting is a research project designed to provide a rigorous basis for evaluating the efficacy of snag retention, mixed-species plantings, variable planting density, and woody vegetation removal as means for regulating the development of biologically and structurally complex forest stands, and for varying the temporal dynamics of fuels profiles and fire risk.

Six species composition, planting density, and vegetation removal treatments (weeding) would be established:

1. Unplanted, woody vegetation not removed
2. Douglas-fir, planted at 435 tpa, woody vegetation removed
3. Mixed species planting, 435 tpa, woody vegetation removed
4. Mixed species planting, 435 tpa, woody vegetation not removed
5. Mixed species planting, 190 tpa, woody vegetation removed
6. Mixed species planting, 190 tpa, woody vegetation not removed

Woody vegetation removal on designated treatment plots will be completed manually prior to planting, in year 1 and in year 3; and in year 5 if necessary, following planting.

Species mixes will consist of the following:

- Sites 3500'+ elevation – Douglas-fir, 20%; White fir, 20%; sugar pine, 20%; incense cedar and ponderosa pine, 20%; hardwood sprouts (Pacific madrone and/or chinquapin oak) 20%.
- Sites <3500' elevation – Douglas-fir, 40%; sugar pine, 20%; incense cedar and ponderosa pine, 20%; hardwood sprouts (Pacific madrone and/or chinquapin oak) 20%.

Where specified, hardwood densities will be obtained by retaining hardwood sprouts, thinned to a single stem per clump, at the 20 percent proportion prescribed.

The treatments will be implemented on both unsalvaged and salvaged sites to evaluate effect of residual snags as microsite modifiers on seedling establishment. Some treatments will be replicated on moderate and harsh planting sites as defined predominantly by aspect (northerly vs. southerly), but also taking into account soil depth (shallow vs. deep) and slope

position (mid vs. upper).

A total of 56, 1.5-ac plots will be established and allocated by treatment condition as outlined in Table E-7 below.

Table E-7. Acreage Requirement by Treatment Condition for Experiments A-C, Combined						
Composition	Density (tpa)	Weeding	Site Aspect	Salvage	Number of Plots	Minimum Acres
No planting	0	Not weeded	Southerly	No salvage	5	7.5
Douglas-fir	435	Weeded	Southerly	No salvage	5	7.5
Mixed-species	435	Weeded	Southerly	No salvage	6	9.0
Mixed-species	435	Not weeded	Southerly	No salvage	6	9.0
Mixed-species	190	Weeded	Southerly	No salvage	5	7.5
Mixed-species	190	Not weeded	Southerly	No salvage	5	7.5
Mixed-species	435	Weeded	Northerly	No salvage	6	9.0
Mixed-species	435	Not weeded	Northerly	No salvage	6	9.0
Mixed-species	435	Weeded	Southerly	No salvage	6	9.0
Mixed-species	435	Weeded	Southerly	Salvage	6	9.0
Total					56	84

Plots will be located, planted and treated in FY04 following salvage. Vegetation monitoring measurements (trees, shrubs, herbaceous) and fuels evaluations will be made in years 1, 2, 3, and 5 following planting. Annual reports will be delivered to the BLM with additional in-depth summaries and interpretations after the third and fifth growing seasons.

It is anticipated that these plots will be maintained and monitored for several decades to achieve project objectives. Beyond the fifth year, sampling frequency and reporting will be dictated by observed vegetation dynamics, continued BLM interest and support, and funding availability.

Cost Estimate:

Estimated costs for the study from Fiscal Year 2004 through 2009 are presented in Table E-8.

Table E-8. Cost Estimates by Activity and Year Assuming Measurement of Basic Response Variables				
Fiscal Year	Costs (x \$1,000)			Total
	Seedling Stock and Planting	Vegetation Control	Data Collection, Analysis, and Reporting	
2004	\$13.2	10.8	54.5	\$900
2005	3.6	7.2	63.9	\$57,200
2006			101.8	0
2007		10.8	65.4	\$60,800
2008			69.0	\$35,000
2009		10.8	60.9	\$60,800
Total	16.8	39.6	415.5	\$320,500

Proposed Restoration Project: Fuel Management Zone (FMZs) (see Map 2-5 and Tables E-9 and E-10)

Project Objectives

Create FMZs to assist in future wildfire suppression activities, to provide for firefighter safety, and to provide anchor points for control lines. To meet the LSRA recommendation for breaking the watershed into 5,000- to 7,000-acre blocks. Construction of FMZs would also meet intent of National Fire Plan by providing protection to Communities at Risk and Wildland Urban Interface areas.

Desired Future Conditions

A series of FMZs on the ridgelines, on the perimeter and within the LSR. Anchor points for fire lines, burnout operations, and possible safety zones for firefighters. LSR divided by FMZs into blocks of 5,000- to 7,000-acres to reduce future fire size.

Project Design Features

Within the burn perimeter, stand replacement areas less than 10 acres would be salvaged to reduce fuel loadings and reduce spotting potential. Proposed units would be located within an identified FMZ and cover between 50-70 acres. A target of six snags per acre would be left standing on or near the ridge top. The preferred leave snags would be the shorter snags. The understory vegetation would be cut, piled, and burned.

In FMZs proposed in the unburned portion of the watershed, the understory conifers and hardwoods would be thinned and slash would be hand-piled. Hand-cutting, hand-piling, and burning of brush would occur. The majority of the conifers cut would be 6" DBH and less. In some cases, small diameter commercial conifers would be cut and removed as needed to reduce crown bulk density to a level that would not perpetuate crown fires. After ladder fuel loadings are reduced, an underburn would be conducted to further reduce ground fuels. This treatment would occur two to five years after the initial entry. A second underburn would occur 10-15 years later. At that time, initial treatment would be finished and any further treatments would be considered maintenance.

Removal of brush and sub-merchantable timber would be accomplished through hazardous fuel reductions contracts. Merchantable timber would be removed through a timber sale contract, where feasible. Approximately 35 acres located in T33S, R1W, Sections 14 and 15 would be proposed for commercial thinning.

The West Branch Fire of 1972, located in T32S, R2W, was reforested and pre-commercially thinned. This area burned again in the Timbered Rock Fire. Stand diameters range from 3-8 inches. Young conifers in this area killed in the Timbered Rock Fire would be cut, piled, and burned. This would aid in reforestation efforts and reduce fuel loads to help reduce future fire severity.

Table E-9. Proposed Fuel Management Zones

Alternative	FMZ Widths	Acres	Cost per Acre	Total Cost
A	No Projects.	0	0	0
B-E, G	200' within LSR; 400' outside LSR	1,300	\$1,100	\$1,430,000
F	200' within LSR; 200' outside LSR	500 within fire area	\$1,100	\$550,000

Table E-10. Fuel Treatment within old West Branch Fire

Alternative	Acres	Cost per Acre	Total Cost
A, F	0		0
B-E, G	70	\$1,000	\$70,000

Restoration Project: Owl Activity Center Underburns (see Map 2-5 and Table E-11)

Project Objectives

The short-term objective is to reintroduce fire to maintain existing reduced fuel loadings and current fuel profiles created by the Timbered Rock Fire, and to simulate the historic natural disturbance process. The long-term objective is to increase the resiliency of sites during future high intensity fire events by reducing fire severity while maintaining owl habitat in late-successional forest conditions.

Desired Future Conditions

Multi-storied stands with low ground fuel loadings. These stands would have a break in the ladder fuels from the ground to the overstory canopy layer.

Project Design Features

This action would capitalize on the natural fuel reduction created by the Timbered Rock Fire. The proposal calls for underburning when fuel moistures for the larger, 6-inch or greater (1000-hour) fuels are at a level too moist for total consumption. The primary carrier of the prescribed fire would be the 0 to 3-inch (1- to 100-hour) fuels, litter layer, and any small brush the fire would consume. These treatments are being proposed on a limited scale to demonstrate effectiveness and ability to meet prescription requirements. The units would be configured using logical topographic breaks and may include all or portions of the owl activity centers and some adjacent areas. In addition, some burning outside the activity centers would be proposed using logical topographic breaks. Burning would occur outside of nesting season.

Initial entry would be in the next 2-3 years or later, if site conditions warrant. The need for follow up treatments would be evaluated and treatment would be proposed when fuel buildups approach the mid- to high-range of Fuel Model 11, or prior to reaching the mid-range of Fuel Model 10 (see Appendix M for fuel model descriptions). The second treatment would occur in 5-10 years and further treatments would occur in the 10- to 20-year range. All treatments will be based on actual conditions and timeframes are approximate. Seasonal restrictions would be implemented to avoid disturbing spotted owl nesting activities.

Table E-11. Proposed Owl Activity Center Underburns				
Alternative	Number of Sites	Number of Acres	Cost per Acre	Total Cost
A	0	0	0	0
B, C, D, E, G	4	425	\$240	\$102,000
F	3	300	\$240	\$72,000

**Proposed Restoration Project: Eagle Habitat Improvement
(see Map 2-6 and Table E-12)**

Project Objectives

To promote growth and future development of large overstory trees into trees with large limbs or broken tops suitable for nesting eagles.

Desired Future Conditions

Scattered individuals and groups of large overstory ponderosa pine, sugar pine, and Douglas-fir trees with large limbs suitable for supporting eagle nests and with openings between branching whorls. The trees would have an open or broken canopy or would be located near the edge of the stand so the eagles would have an unrestricted flyway. Tall perch trees would be present at the edges of the stand. These nest stands would be located on the ridge between Lost Creek Lake and Elk Creek.

Project Design Features

Younger stands would be treated to promote growth of large overstory ponderosa pine, sugar pine, and Douglas-fir with large boles and thick limbs, strong enough to support the large stick nests built by bald eagles and golden eagles. Smaller trees around the meadow edges would be thinned. A residual conifer spacing of 12-20' would be implemented in stands less than 30 years old to promote the development of large trees with the desired habitat attributes, such as large limbs and whorls.

Stands with existing large overstory trees, treatments would improve the vigor of large overstory sugar pine, ponderosa pine, and Douglas-fir. Removing competing vegetation around selected trees would increase resistance to mortality from fire. Vegetation would be removed around the reserved large trees by clearing 10-15' out from the drip line of the pine. Co-dominant trees with crowns touching the selected trees would be removed unless the removal would harm reserve trees. Projects would be coordinated with proposed fuel management projects.

Two areas are proposed for treatment:

- T33S, R1E, Section 15 - Around the meadows in the north central part of the section and the NWSW part of the section. The project would occur along the west side of the meadow and extend 300 feet into the stand. Two areas extend outside the project boundary into the Lost Creek Watershed; approximately 200 feet in one area and 100 feet in the second area.
- T33S, R1E, Section 21 - Located within a proposed pine restoration project area. The project would occur along the north and west edge and extend 300 feet into the stand.

Table E-12. Eagle Nesting Habitat Projects

Alternatives	Location	Acres	Treatment	Costs
B-E, G	T33S, R1E, Sec. 15	30	Pre-commercial thinning; Pile and burn	\$21,000
B-E, G	T33S, R1E, Sec. 21	20	Pile and burn	\$10,000
A, F	No Projects			

Proposed Restoration Project: Maintain or Create Log Piles for Wildlife Habitat (see Map 2-6 and Table E-13)

Project Objectives

To provide denning/hiding/resting/foraging/escape sites for animals, including larger mammals such as American martin, fisher, bobcat, cougar, and bear.

Desired Future Conditions

Scattered piles of large wood with spaces to provide denning, hiding, resting, foraging, or escape sites for animals, including larger mammals such as American martin, fisher, bobcat, cougar, and bear.

Project Design Features

During salvage operations, leave piles of fallen logs in the selected areas where trees were cut to clear the right-of-way for the Pacific Power powerline in T32S, R1E, Section 5. Selected piles would be located near the east and west borders of section and one in the middle, away from the road.

Place or leave three additional piles of larger wood between West Branch Elk Creek and Flat Creek. These would be at or near the end of a road that will be closed either with a permanent block, earthen berm, or gate. This would be completed as part of the roadside salvage. Piles would be located in areas where roads identified for decommissioning are closed to traffic.

Piles should be approximately 20' x 20' and 4-6' high and provide space to allow animals access within the piles. Larger logs (>16" DBH) would be stacked in a loose, crisscross/haphazard pile in a way that would create spaces beneath the wood. The logs could be smaller lengths, broken tops, and boles large enough to stack with spaces between.

Logs would be obtained from salvage operations. Broken parts and whole logs would be hauled to location and piled. Piles should be located in the largest accumulation of trees. Pile locations could be moved to a different site if adjacent land owners object to specific road closures, or if there are inadequate snags in an area near the selected location.

Table E-13. Log Piles for Wildlife Habitat

Alternatives	Location	Number of Piles	Cost
A, B	No Projects	0	0
C, D, E, F, G	T32S, R1E, Sec. 5	3	\$600
C, D, E, F, G	T32S, R1E, Sec. 24	1	\$200
C, D, E, F, G	T32S, R1E, Sec. 29	1	\$200
C, D, E, F, G	T32S, R1E, Sec. 24	1	\$200

Proposed Restoration Project: Road Reconstruction
(see Map 3-3b and Table E-14)

Project Objectives

Stabilize roads to reduce the risk of road failure.

Desired Future Conditions

Roads in a stable condition with a low risk of failure.

Project Design Features

Add drainage structures such as culverts and armored drain dips to reduce the chance of the road becoming saturated by water and failing. Remove unstable material from shoulders of roads and place large rocks on the face to armor the surface and function as a retaining structure to hold the fill in place. It is anticipated there would be a greater need for maintenance on roads within the fire over the next few years.

Table E-14. Road Reconstruction Projects

Alternative	Road Number	Description	Amount	Treatment	Cost
A	No Projects.				
B-G	32-1-9.1	Road near stream; Steep grade	2,750 Linear Feet	Add Drainage	\$ 2,750
B-G	32-1-10.1	Unstable road fills	4,750 Linear Feet	Stabilize	\$ 142,500
B-G	32-1-23.0	Road near stream	4,400 Linear Feet	Add Drainage	\$4,400
B-G	32-1-26.0	Road near stream	2,000 Linear Feet	Add Drainage	\$2,000
Totals			13,900 Linear Feet		\$151,650

Proposed Restoration Project: Road Stream-Crossing Upgrades (see Map 3-3b and Table E-15)

Project Objectives

Reduce the risk of road damage from debris torrents plugging culverts and diverting stream flows down roads.

Desired Future Conditions

Road fills constructed of rock, rather than mixed soil and rock fills at stream crossings in high risk locations. Road segments below the pipe would be protected from water or debris torrents diverting from the channel and eroding a gully in the roadbed.

Project Design Features

Road fills constructed out of soil and rock fill material at high risk stream crossings would be replaced with rock fills. These fills would be designed with a dip over the culvert to keep the stream flow in the channel in case the culvert plugs. Culverts would be upsized to pass 100-year storm events and allow movement of water, gravels, and debris through the culvert.

Table E-15. Stream-Crossings Proposed for Upgrade

Alternative	Location	Risk Rating	Quantity	Treatment	Effect	Cost
A	No Projects.					
B, E, F	32-1E-10.1	5	300 c.y.	Reconstruct	Episodic 150 c.y.	\$15,000
B, E, F	32-1E-10.1	5	300 c.y.	Reconstruct	Episodic 150 c.y.	\$15,000
B, E, F	32-1E-10.1	4	200 c.y.	Reconstruct	Episodic 100 c.y.	\$15,000
C, D, E, F, G	32-1E-15.0	4	200 c.y.	Reconstruct	Episodic 100 c.y.	\$15,000
C, D, E, F, G	32-1E-17.4	3	300 c.y.	Reconstruct	Episodic 150 c.y.	\$15,000
C, D, E, F, G	32-1E-17.4	3	300 c.y.	Reconstruct	Episodic 150 c.y.	\$15,000
C, D, E, F, G	32-1E-20.0	4	200 c.y.	Reconstruct	Episodic 100 c.y.	\$8,000
C, D, E, F, G	32-1E-20.0	4	200 c.y.	Reconstruct	Episodic 100 c.y.	\$8,000
C, D, E, F, G	32-1E-20.0	4	200 c.y.	Reconstruct	Episodic 100 c.y.	\$8,000
C, D, E, F, G	32-1E-20.0	4	200 c.y.	Reconstruct	Episodic 100 c.y.	\$8,000
B, E, F	32-1E-20.1	5	300 c.y.	Reconstruct	Episodic 150 c.y.	\$15,000
B, E, F	32-1E-20.1	5	300 c.y.	Reconstruct	Episodic 150 c.y.	\$15,000
B, E, F	32-1E-20.1	5	300 c.y.	Reconstruct	Episodic 150 c.y.	\$15,000
B, E, F	32-1E-20.1	5	300 c.y.	Reconstruct	Episodic 150 c.y.	\$15,000
B, E, F	32-1E-20.1	5	300 c.y.	Reconstruct	Episodic 150 c.y.	\$15,000
B, E, F	32-1E-20.2	5	300 c.y.	Reconstruct	Episodic 150 c.y.	\$15,000
B, E, F	32-1E-20.2	5	300 c.y.	Reconstruct	Episodic 150 c.y.	\$15,000
B, E, F	32-1E-20.2	5	300 c.y.	Reconstruct	Episodic 150 c.y.	\$15,000
C, D, E, F, G	32-1E-20.4	5	300 c.y.	Reconstruct	Episodic 150 c.y.	\$15,000
B, E, F	32-1E-29.0	5	300 c.y.	Reconstruct	Episodic 150 c.y.	\$15,000
B, E, F	32-1E-30.1	5	300 c.y.	Reconstruct	Episodic 150 c.y.	\$15,000
C, D, E, F, G	32-1W-13.0	4	200 c.y.	Reconstruct	Episodic 100 c.y.	\$15,000
C, D, E, F, G	33-1E-4.0	4	200 c.y.	Reconstruct	Episodic 100 c.y.	\$15,000
B, E, F	33-1E-8.0	5	300 cy	Reconstruct	Episodic 150 c.y.	\$15,000
B, E, F	33-1E-8.0	5	300 cy	Reconstruct	Episodic 150 c.y.	\$15,000
C, D, E, F, G	33-1E-26.5	3	200 c.y.	Remove Fills	Episodic 150 c.y.	\$8,000
NOTE: In Risk Rating category, 3 is lowest risk of fill failure; 5 is highest risk.						

Proposed Restoration Project: Road Maintenance
(see Map 3-3b and Table E-16)

Project Objectives

To restore or improve road segments identified in the Transportation Management Objectives (TMO) process to the desired standard.

Desired Future Conditions

To maintain road access through BLM-administered lands while minimizing erosion and sedimentation from these roads and protecting water quality.

Project Design Features

Roads would be maintained and improved, as needed. Maintenance may include: blading and shaping the road surface, adding rock to the road surface, brushing the roadsides, cleaning the ditches, cleaning culvert catch basins, cleaning or replacing culverts, and adding drainage structures such as culverts and drain dips

Table E-16. Road Maintenance		
Alternative	Miles of Road	Cost per Mile
A	0	0
B, C, D, G	100	\$792,000
E	115	\$814,000
F	68	\$763,000

Proposed Restoration Project: Road Decommissioning (see Map 3-3b and Table E-17)

Project Objectives

To reduce the road density in the Key Watershed by decommissioning road segments identified in the TMO process. In addition, identify road segments for closure to reduce wildlife harassment, degradation to the road surface, and trash dumping.

Desired Future Conditions

Appropriate access to provide for administrative needs and public use. Most roads out of the riparian areas, and few with native surfaces. Access across public lands through reciprocal rights agreements will be maintained.

Project Design Features

Roads will be decommissioned or closed as identified from the TMO process.

Table E-17. Miles of Road for Closure or Decommissioning

Alternative	Miles of Decommissioning		Decommissioning Costs	Road Closures		Closure Costs	Total Cost
	Partial	Full		Miles	Gates		
A	0	0	\$0	0	0	\$0	\$0
B, C, D, G	2.5	33	\$243,500	21	16	\$22,000	\$265,000
E	5.3	38	\$292,500	21	16	\$15,750	\$308,250
F	1.4	15.1	\$112,700	14.4	11	\$22,000	\$134,700
Note: Gates cost \$2,000 each and barricades are \$750 each.							

Proposed Restoration Project: Seasonal Road Closures (see Map 2-7 and Table E-18)

Project Objectives

Reduce damage to road surface during the wet season and protect sensitive fish species from surface road erosion; protect wildlife from poaching and harassment; and reduce trash dumping.

Desired Future Conditions

Year-round vehicle access would be restricted to mainline roads. Secondary and non-surfaced roads would be seasonally closed to motorized vehicles from mid-October through April 30. Only foot and non-motorized traffic would be allowed on closed roads during the wet season. All roads would be available for motorized vehicle traffic (unless fire restrictions are in place) from May 1 through mid-October. Roads would remain open to administrative access for landowners, BLM employees, and BLM contractors and permittees.

Project Design Features

Road closures would be seasonally closed to motor vehicles from mid October through April 30. Roads across private lands may or may not be closed by the landowner.

Table E-18. Roads to Remain Open Year-round

Alternative	Road Number	Description
E, G	33-1W-8.0	Buck Rock Road to West Branch
E, G	33-1W-10.0; 32-1W-26.1	Morine Tie Road
E, G	33-1E-17.0; 32-1W-26.0 to intersection with 32-1W-23.2	West Branch Elk Creek Road
E, G	32-1W-26.5	Alco Creek Road
E, G	32-1E-27.0; 32-1E-18.0 to intersection with 32-1E-18.3; 32-1E-20.0 to 32-1E-17.4; 32-1W-13	Flat Creek Road
E, G	32-1E-17.4 to 32-1E-17.5 to 32-1E-7.2	
E, G	32-1E-23.2; 32-1E-22.0	Miller Mountain Road
E, G	32-1E-23.0 to intersection with 32-1E-9.1, before stream ford	Sugarpine Creek Road
E, G	32-1E-10.1 to 32-1E-9.0; 32-1E-9.0	Gobblers Knob Road
E, G	32-1E-11.4 and FS 31	Elkhorn Ridge Road
E, G	32-1E-13.1 to intersection with 13.2 and 32-1E-13.2 to end of rock area at boundary with section 11	North Mule Hill
E, G	32-1W-23.2	Ragsdale Butte
E, G	32-1W-36.1	
NOTE: No project proposed for Alternatives A, B, C, D, and F.		

Proposed Restoration Project: Pump Chance Restoration (see Figure 2.3-1 and Table E-19)

Project Objectives

To restore existing pump chances and helicopter dip ponds for future fire suppression needs.

Desired Future Conditions

To have pump chances and helicopter dip ponds that will hold adequate pools of water, about 500 gallons, to be used primarily for initial attack fire suppression.

Project Design Features

Seven sites have been identified for restoration. The work would include cleaning pump chance pools by excavating gravels, soil, and vegetation that have built up. Excavated materials would be moved to an appropriate disposal site. Water inlets and outlets would be cleaned or repaired and rock would be added to access ramps as needed. Access ramps should have an adequate rock surface and be brushed to accommodate up to 4,000 gallon water tenders. Cascade Frogs would be protected by a seasonal restriction with no restoration occurring from mid-March to August 31.

Table E-19. Pump Chances Proposed for Restoration

Alternatives	Location	Remove Pool Materials	Other	Cost
A	No Projects			
B, C, D, F, G	32-1W-13.0	N/A	Replace Pipe; Brush Access	\$750
B, C, D	32-1W- 23.0	5 yd ³	Build Gates	\$1,500
B, C, D, F, G	32-1W- 25.2	5 yd ³	Replace Pipe; Rock Access	\$1,000
B, C, D	32-1W- 26.0	Minor	None	\$500
B, C, D, F	32-1W- 26.9	20 yd ³	Replace Pipe; Rock Access	\$2,000
B, C, D	33-1W-8.0	Minor	Replace Pipe	\$750
B, C, D	33-1W-14.0	Minor	Rock Access; Brush Access	\$250

Proposed Restoration Project: Rock Quarry Closure and Rehabilitation (see Figure 2.3-1 and Table E-20)

Project Objectives

To close and rehabilitate rock quarries where the usable rock has been depleted and to minimize erosion from steep side slopes and lack of vegetation.

Desired Future Conditions

Abandoned rock quarries with vegetation growing in them and blended into the landscape.

Project Design Features

Rock quarries that are no longer viable would have benches sloped, soil imported (if necessary), and vegetation planted. Any oversized or usable material would be stored at the quarry or moved to another location where it would be stored until needed.

Five quarries are proposed for treatment: Gobblers Knob, Elk Horn Creek, Hawk Creek, Old Flat Creek, and West Branch Elk Creek.

Table E-20. Rock Quarries Proposed for Closure and Rehabilitation

Alternative	Location	Quarry Number	Quarry Name	Cost
A	No Projects			
B-G	T32S, R1E, Sec. 8	251	Gobblers Knob	\$3,500
B-G	T32S, R1E, Sec. 3	316	Elk Horn Creek	\$3,500
B-G	T32S, R1E, Sec. 8	317	Hawk Creek	\$3,500
B-G	T32S, R1E, Sec. 29	334	Old Flat Creek	\$3,500
B-G	T33S, R1E, Sec. 7	337	West Branch Elk Creek	\$3,500